

## NATURAL RESOURCES CONSERVATION SERVICE

### CONSERVATION PRACTICE STANDARD

## DIVERSION

(Ft.)

CODE 362

### DEFINITION

A channel constructed across the slope generally with a supporting ridge on the lower side.

conservation cropping or stripcropping systems.

### PURPOSE

This practice may be applied as part of a resource management system to support one or more of the following purposes.

- Break up concentrations of water on long slopes, on undulating land surfaces, and on land that is generally considered too flat or irregular for terracing.
- Divert water away from farmsteads, agricultural waste systems, and other improvements.
- Collect or direct water for water-spreading or water-harvesting systems.
- Increase or decrease the drainage area above ponds.
- Protect terrace systems by diverting water from the top terrace where topography, land use, or land ownership prevents terracing the land above.
- Intercept surface and shallow subsurface flow.
- Reduce runoff damages from upland runoff.
- Reduce erosion and runoff on urban or developing areas and at construction or mining sites.
- Divert water away from active gullies or critically eroding areas.
- Supplement water management on

### CONDITIONS WHERE PRACTICE APPLIES

This applies to all cropland and other land uses where surface runoff water control and management is needed. It also applies where soils and topography are such that the diversion can be constructed and a suitable outlet is available or can be provided. Diversions generally should not be substituted for terraces on land requiring terracing for erosion control.

### CRITERIA

**Capacity.** Diversions as temporary measures, with an expected life span of less than 2 years, shall have a minimum capacity for the peak discharge from the 2-year frequency, 24-hour duration storm.

Diversions that protect agricultural land shall have a minimum capacity for the peak discharge from a 10-year frequency, 24 -hour duration storm.

Diversions designed to protect areas such as urban areas, buildings, roads, and animal waste management systems shall have a minimum capacity for the peak discharge from a storm frequency consistent with the hazard involved but not less than a 25-year frequency, 24-hour duration storm. Freeboard shall be not less than 0.3 ft.

Design depth is the channel storm flow depth plus freeboard, where required.

**Cross section.** The channel may be parabolic, V-shaped, or trapezoidal. The diversion shall be designed to have stable side

slopes.

The ridge shall have a minimum top width of 4 feet at the design depth. The ridge height shall include an adequate settlement factor.

The ridge top width may be 3 feet at the design depth for diversions with less than 10 acres drainage area above cropland, pastureland, or woodland.

The top of the constructed ridge at any point shall not be lower than the design depth plus the specified overfill for settlement.

The design depth at culvert crossings shall be the culvert headwater depth for the design storm plus freeboard.

**Grade and velocity.** Channel grades may be uniform or variable. Channel velocity shall not exceed that considered non-erosive for the soil and planned vegetation or lining.

Maximum channel velocities for permanently vegetated channels shall not exceed those recommended in the NRCS Engineering Field Handbook (EFH) Part 650, Chapter 7, or Agricultural Research Service (ARS) Agricultural Handbook 667, Stability Design of Grass-Lined Open Channels (Sept. 1987).

When the capacity is determined by the formula  $Q = A V$  and the  $V$  is calculated by using Manning's equation, the highest expected value of "n" shall be used.

**Location.** The outlet conditions, topography, land use, cultural operations, cultural resources, and soil type shall determine the location of the diversion. Diversions in cultivated fields should be aligned to permit the most convenient use of modern farm equipment.

**Protection against sedimentation.**

Diversions normally should not be used below high sediment producing areas. When they are, a practice or combination of practices needed to prevent damaging accumulations of sediment in the channel shall be installed. This may include practices such as land treatment erosion control practices, cultural or tillage practices, vegetated filter strip, or structural measures. Install practices in conjunction with or before the diversion construction.

If movement of sediment into the channel is a problem, the design shall include extra capacity

for sediment or periodic removal as outlined in the operation and maintenance plan.

**Outlets.** Each diversion must have a safe and stable outlet with adequate capacity. The outlet may be a grassed waterway, a lined waterway, a vegetated or paved area, a grade stabilization structure, an underground outlet, a stable watercourse, a sediment basin, or a combination of these practices. The outlet must convey runoff to a point where outflow will not cause damage. Vegetative outlets shall be installed and established before diversion construction to insure establishment of vegetative cover in the outlet channel.

The release rate of an under ground outlet, when combined with storage, shall be such that the design storm runoff will not overtop the diversion ridge.

The design depth of the water surface in the diversion shall not be lower than the design elevation of the water surface in the outlet at their junction when both are operating at design flow.

**Vegetation.** Disturbed areas that are not to be cultivated shall be seeded as soon as practicable after construction.

**Lining.** If the soils or climatic conditions preclude the use of vegetation for erosion protection, non-vegetative linings such as gravel, rock riprap, cellular block, or other approved manufactured lining systems may be used.

## CONSIDERATIONS

A diversion in a cultivated field should be aligned and spaced from other structures or practices to permit use of modern farming equipment. The side slope lengths should be sized to fit equipment widths when cropped.

At non-cropland sites, consider planting native vegetation in areas disturbed due to construction.

Maximize wetland functions and values with the diversion design. Minimize adverse effects to existing functions and values. Diversion of upland water to prevent entry into a wetland may convert a wetland by changing the hydrology. Any construction activities should minimize disturbance to wildlife habitat.

Opportunities should be explored to restore and improve wildlife habitat, including habitat for threatened, endangered, and other species of concern.

On landforms where archeological sites are likely to occur, use techniques to maximize identification of such sites prior to planning, design, and construction.

## **PLANS AND SPECIFICATIONS**

Plans and specifications for installing diversions shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose.

## **OPERATION AND MAINTENANCE**

An operation and maintenance plan shall be prepared for use by the client. The plan shall include specific instructions for maintaining diversion capacity, storage, ridge height, and outlets.

The minimum requirements to be addressed in the operation and maintenance plan are:

1. Provide periodic inspections, especially immediately following significant storms.
2. Promptly repair or replace damaged components of the diversion as necessary.
3. Maintain diversion capacity, ridge height, and outlet elevations especially if high sediment yielding areas are in the drainage area above the diversion. Establish necessary clean-out requirements.
4. Each inlet for underground outlets must be kept clean and sediment buildup redistributed so that the inlet is at the lowest point. Inlets damaged by farm machinery must be replaced or repaired immediately.
5. Redistribute sediment as necessary to maintain the capacity of the diversion.
6. Vegetation shall be maintained and trees and brush controlled by hand, chemical and/or mechanical means. Mowing should be done at least annually. When practical, delay mowing until after July 15 to accommodate ground nesting wildlife. Mow to a height of 4-6" to help maintain good surface protection. Excessive growth shall be removed. Do not mow later than 30 days prior to the first killing frost (average date).
7. Keep machinery away from steep sloped ridges. Keep equipment operators informed of all potential hazards.
8. As practical perform all cultural operations at right angles to the flow of water to reduce erosion.

## **CONSTRUCTION SPECIFICATION**

### **NATURAL RESOURCES CONSERVATION SERVICE**

#### **4. Fill**

#### **DIVERSION**

##### **1. Scope**

The work shall consist of constructing a channel across the slope with a supporting ridge on the lower side as shown on the drawings or as staked in the field. The work shall also include establishment of adapted vegetation for safe disposal of runoff.

##### **2. Foundation preparation**

The foundation for the earthfill shall be stripped to remove vegetation and other unsuitable materials. All brush, trees, stumps, and fencerow material shall be moved and disposed of properly. All ditches or gullies shall be filled, and trees and other obstructions shall be removed before construction begins or shall be part of the construction.

##### **3. Disposal**

All earth removed and not needed in construction shall be spread or disposed of in such a way that it will not interfere with the functioning of the diversion. Care must be taken in spreading waste material so that neither ridges nor holes are formed along sides of the diversion.

Fill material shall be free of roots, large stones, and other objectionable material. The moisture content of fill material shall be such that bonding and compaction are attained to prevent uneven settlement that would cause damage to the completed diversion.

If underground conduits are located under diversion ridges installation and backfill of conduit trenches shall be made in advance to allow adequate settlement. Compaction methods such as mechanical compaction or water packing shall be used around the conduit to insure a cohesive fill that will have minimal seepage and settlement. The materials used for the inlet and conduit shall be suitable for the purpose intended and shall meet the requirements of Conservation Practice Standard, Underground Outlet, Code 620.

Fill material shall be placed in uncompacted layers of 9 inches or less. Each layer shall be compacted by at least one passage of the construction equipment's wheel or track tread. All portions of the diversion shall be finished and smoothed in a professional manner such that applied vegetation cover can be properly maintained.

When specified, the topsoil should be removed, stockpiled, and replaced on the diversion after construction. This is especially desirable where a crop is to be harvested from the area.

The top of the constructed diversion ridge shall not be lower at any point than the design

elevation plus any overfill required for settlement.

## **5. Pollution control**

Construction operations shall be carried out so that erosion and sediment control is addressed and air and water pollution is minimized. This may include such items as silt fence, hay bale barrier, temporary vegetation, and mulching.

## **6. Vegetation**

Vegetation shall be established as specified in the vegetative plan. Seeding and sodding will be in accordance with Conservation Practice Standard, Critical Area Planting, Code 342.